

Introduction to SpectroChip

An Optical System-on-Chip Enabling Ultra-Portable Devices for Broad Industrial Sensing Applications

Webinar
Feb. 21, 2024
8am - 9am PST



Dr. Kevin Ko
Chairman, SPU System
& SpectroChip



Dr. Sean Lin
President SPU System,
SpectroChip (BOD)

- **MSIG Introduction**
 - Paul Carey, MSIG Director [5 minutes]
- **SPU System Presentation:**
 - Kevin Ko and Sean Lin [40 minutes]:
 - General Q&A [5 minutes]
- **MSIG Closing [5 minutes]**





SEMI MSIG Overview

Paul Carey, Ph.D.
Director SEMI MSIG

December 6, 2023

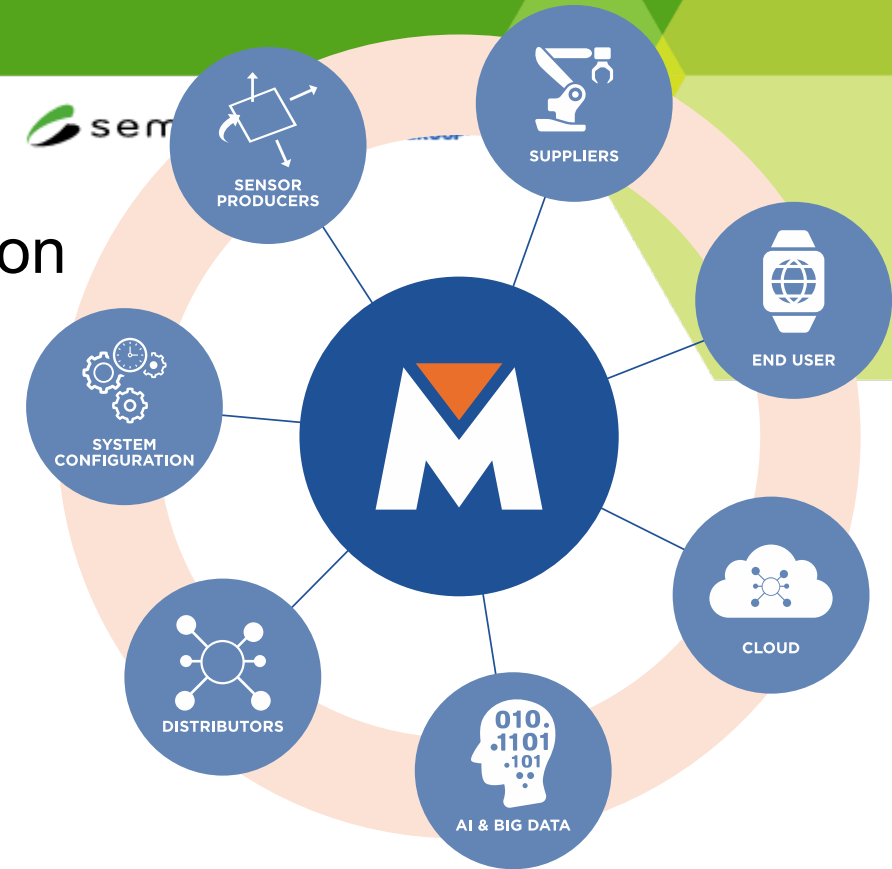
■ SEMI

- **The** premier global semiconductor trade organization
- 3000+ member companies
- Your gateway to the semiconductor supply chain



■ MEMS and Sensors Industry Group (MSIG)

- Technical Community within SEMI
- 200+ member companies worldwide
 - *Members connected to the sensor supply chain*
- Mission - Support member company growth with:
 1. Education and Networking ([conference & events](#))
 2. Promotional opportunities ([SEMI blogs, webinars, social media](#))
 3. Collaborative problems solving ([industry task forces and workgroups](#))
 4. R&D funds ([\\$25M 2022-2027 in positioning, navigation, and timing sensors](#))
 5. New opportunities and markets ([e.g. BusDev in Smart Cities](#))



MSIG website: msig.org

PARTICIPATING COMPANIES INCLUDE



And Over 180 More Companies!



MSIG Events

2024 MSIG Program Calendar

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MSIG GC	MSIG GC Meeting			MSIG GC Meeting			MSIG GC Meeting				MSIG GC Meeting	
Federal R&D Program	PNT GC/TAC	PNT GC/TAC	PNT GC/TAC					TC Executive GC Meeting		PNT GC/TAC		
	PNT22 Quarterly Project Reviews											
	PNT23 Full Proposals Ranked, New Projects Awarded, Annual Program Plan to ARL			PNT23 Contracting			PNT23 Quarterly Project Reviews					
				PNT24 Gap Analysis			PNT24 Activities: RFP Announcement, White Paper & Full Ranking, Award Notification, Annual Program Plan to ARL					
Community Engagement & Promotion			Quarterly Newsletter			Quarterly Newsletter			Quarterly Newsletter			Quarterly Newsletter
	MSIG Webinar	MSIG Webinar			MSIG Webinar	MSIG Webinar	MSIG Webinar			MSIG Webinar		MSIG Webinar
	Monthly Workgroup Meetings: Device, Manufacturing, Reliability, Smart City + MSIG Promotion, Outreach, Blogs and Happy Hours											
Events	 AUSTIN, TEXAS • JAN 21-25, 2024 Jan 21 – 25 Austin, TX				 May 1-2 UCLA	 June 2-6 Hilton Head, SC			 Sept 11-24 Shanghai, China	 TBD	 Nov 11-15 Chicago, IL	
	 Jan 31 – Feb 2 Seoul, Korea		 Mar 20 – 22 Shanghai, China	 April 4/14-4/16 Shenzhen	 May 8-10 Raleigh, NC	 June 24-26 Santa Clara	 July 11 - 13 San Francisco, CA		 Sept. 4 - 6 Taipei, Taiwan	 Sept. 11 - 13 Greater Noida, Delhi, India	 With SEMICON EUROPA  November 12 - 15 Munich, Germany	 Dec 11 - 13 Tokyo, Japan



**PNT Gap Analysis -
Scan for more
information**



**MSTC - Scan for
more information**

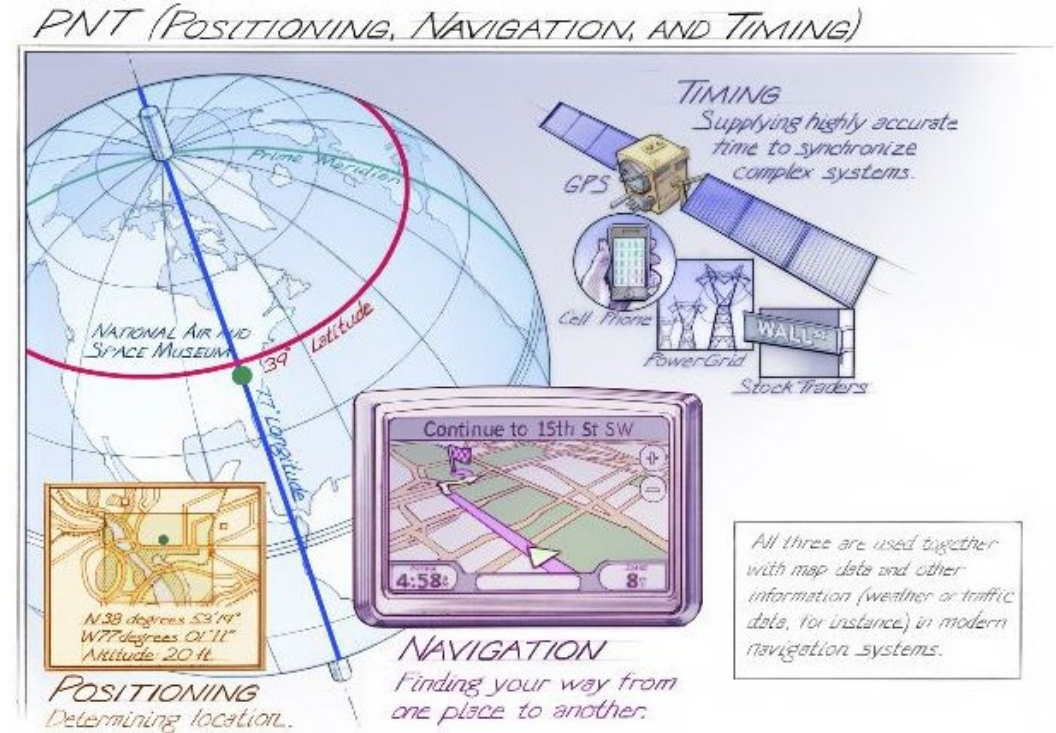


MSIG R&D Funding

Positioning, Navigation, and Timing (PNT) R&D Program

- **Program Funding (2022-2027):**
 - SEMI/ARL: **\$25M (\$5M/year)**
 - Cost share requirement (%): $\geq 50\%$
- **Example projects funded:**
 - Low-SWaP-C*, GPS-Free gyros and accelerometers
 - Novel sensor materials, resonators
 - Quantum sensors (lasers, PICs**)
- **2023 Status:**
 - 9 new projects started
 - October: new PNT RFP announced
 - New projects coming in 2024

MSIG PNT Program: dual use technology good for both private and public sectors



*SWaP-C = Size, Weight, & Performance, & Cost

**PICs = Photonic Integrated Circuits

SEMI-MSIG PNT Funded Institutions

Item	Phase I (2020-2022)	Phase II to date (2022-2027)
1	GE Research	PARC
2	PARC	Honeywell (IMU Calibration)
3	Teledyne Scientific	Honeywell (3D Package)
4	Georgia Tech	Nexus Photonics
5	Analog Devices	ColdQuanta/Infleqtion
6	SiTime	Georgia Tech
7	Carnegie Mellon	GE Research
8	Twinleaf	Teledyne Scientific
9	Honeyell	Purdue



Back to Today's Webinar

- **MSIG Introduction**
 - Paul Carey, MSIG Director [5 minutes]
- **SPU System Presentation:**
 - Kevin Ko and Sean Lin [40 minutes]:
 - General Q&A [5 minutes]
- **MSIG Closing [5 minutes]**





Questions?

- **MSIG Introduction**

- Paul Carey, MSIG Director [5 minutes]



- **SPU System Presentation:**

- Kevin Ko and Sean Lin [40 minutes]:
- General Q&A [5 minutes]



- **MSIG Closing [5 minutes]**



Scan for more information

2024 MSIG Program Calendar

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MSIG GC	MSIG GC Meeting			MSIG GC Meeting			MSIG GC Meeting				MSIG GC Meeting	
Federal R&D Program	PNT GC/TAC	PNT GC/TAC	PNT GC/TAC					TC Executive GC Meeting		PNT GC/TAC		
	PNT22 Quarterly Project Reviews											
	PNT23 Full Proposals Ranked, New Projects Awarded, Annual Program Plan to ARL			PNT23 Contracting			PNT23 Quarterly Project Reviews					
				PNT24 Gap Analysis			PNT24 Activities: RFP Announcement, White Paper & Full Ranking, Award Notification, Annual Program Plan to ARL					
Community Engagement & Promotion			Quarterly Newsletter			Quarterly Newsletter			Quarterly Newsletter			Quarterly Newsletter
	MSIG Webinar	MSIG Webinar			MSIG Webinar	MSIG Webinar	MSIG Webinar			MSIG Webinar		MSIG Webinar
	Monthly Workgroup Meetings: Device, Manufacturing, Reliability, Smart City + MSIG Promotion, Outreach, Blogs and Happy Hours											
Events					 May 1-2 UCLA	 June 2-6 Hilton Head, SC		 Sept 11-24 Shanghai, China	 TBD	 Nov 11-15 Chicago, IL		
	 Jan 31 – Feb 2 Seoul, Korea		 Mar 20 – 22 Shanghai, China		 May 8-10 Raleigh, NC	 May 28 - 30 Penang, Malaysia	 June 24-26 Santa Clara	 July 11 - 13 San Francisco, CA	 Sept. 4 - 6 Taipei, Taiwan		 November 12 - 15 Munich, Germany	 Dec 11 - 13 Tokyo, Japan

THANK YOU



Paul Carey
MSIG Director



Questions?
Email me:
pcarey@semi.org



Thank you!

- 1. Both the SiO₂ and HfO₂ processes use a CRISP conversion, you mention it uses a catalyst, can you elaborate?**
- 2. Can you explain why a multilayer moisture barrier performs better than a single layer ALD barrier?**
- 3. You mention that the Sundew tools are an established technology, have they been used in production and if so, how long?**

1. Ultra-Sensitive Piezoelectric Force Sensors that Improve Semiconductor Manufacturing
 - Date: October 19, 2022
 - Presenters: Jim Macy & Robert Hillinger, [Kistler](#)
2. Tunnel Magnetoresistance Sensors: From Concept to Commercialization
 - Date: December 14, 2022
 - Presenter: Dr. Anuraag Mohan, [Crocus Technology](#)
3. (1) Wafer Fabricated Atomic Reference Cells ([Twinleaf](#))
(2) Laser Based Magnetic Field Sensor Formation for GMR/TMR Sensor Arrays ([3D-Micromac](#))
 - Date: January 11, 2023 (8-9am PST) – **TODAY**
 - Presenters: Dr. Tom Kornack, Twinleaf & Dr. Dirk Lewke, 3D-Micromac
4. High Efficiency Interface Materials for the Next Generation of MEMS & Sensors Packages
 - Date: February 15, 2023 (8-9am PST)
 - Presenter: Nikhil Jani, [Zeon Specialty Materials](#)

Student Debt Ranking

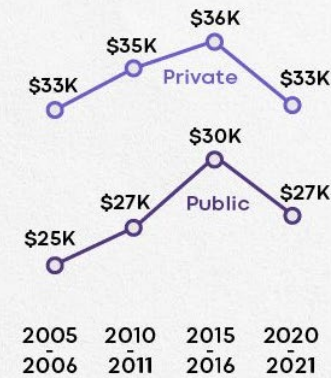
U.S. BACHELOR'S DEGREES

College Major

2022 Median Debt

Behavioral Sciences	\$42.8K
Religious Education	\$32.0K
Human Services	\$28.6K
Culinary Arts & Related Services	\$28.6K
Education	\$28.0K
Clinical, Counseling, & Applied Psychology	\$27.4K
Literature	\$27.0K
Natural Sciences	\$26.9K
Physical Sciences	\$26.6K
Music	\$26.6K
Visual & Performing Arts	\$26.5K
Arts, Entertainment, & Media Management	\$26.5K
Architecture	\$26.5K
Health Professions & Related Clinical Sciences	\$26.0K
Communication, Journalism	\$25.9K
Drama/Theater Arts & Stagecraft	\$25.8K
Astronomy & Astrophysics	\$25.6K
Engineering	\$25.5K
Multi/Interdisciplinary Studies	\$25.4K
Aerospace & Astronautical Engineering	\$25.2K
Biological & Physical Sciences	\$25.2K
Foods, Nutrition, & Related Services	\$25.2K
Biochemical Engineering	\$25.1K
Information Science/Studies	\$25.1K
Film/Video & Photographic Arts	\$25.0K
Social Work	\$24.9K
Zoology/Animal Biology	\$24.7K
Civil Engineering	\$24.6K

Average Bachelor's Degree Debt Over Time



Public 4-year vs private nonprofit 4-year

Civil Engineering	\$24.6K
City/Urban & Regional Planning	\$24.5K
Criminal Justice & Corrections	\$24.5K
Mechanical Engineering	\$24.5K
Radio, Television, & Digital Communication	\$24.4K
Business Administration, Management	\$24.4K
Health & Physical Education/Fitness	\$24.2K
Accounting	\$24.1K
Computer & Information Sciences	\$24.0K
PR, Advertising, & Applied Communication	\$23.9K
Chemical Engineering	\$23.8K
Biology	\$23.7K
Journalism	\$23.4K
Criminology	\$23.4K
Liberal Arts & Sciences, Humanities	\$23.3K
Botany/Plant Biology	\$23.3K
Psychology	\$23.3K
Public Health	\$23.1K
Archeology	\$23.0K
Communication and Media Studies	\$22.8K
Social Sciences	\$22.8K
Chemistry	\$22.8K
Hospitality Administration/Management	\$22.8K
Physics	\$22.8K
History	\$22.8K
Registered Nursing	\$22.6K
English Language & Literature	\$22.5K
Sociology	\$22.3K
Computer Science	\$22.2K
Marine Sciences	\$22.2K
Political Science & Government	\$22.0K
Science, Technology, & Society	\$21.8K
Mathematics	\$21.8K
Anthropology	\$21.7K
Geography & Cartography	\$21.7K
Animal Sciences	\$21.6K
Environmental Design	\$21.2K
Agricultural	\$20.8K
Economics	\$20.7K
Statistics	\$20.6K
Philosophy	\$20.6K
Public Administration	\$20.6K
International/Global Studies	\$19.9K
Business Operations Support	\$19.1K
Cognitive Science	\$18.1K
Comparative Education	\$13.0K

Source: Education Data Initiative (2023); median debt per major for Bachelor's degree

Biosensors – Enormous Opportunity and Big Challenges



Jessica Gomez
Founder and CEO
Rogue Valley Microdevices

Webinar Sponsor: Forge Nano



forgenano.com



MSEC

MEMS & Sensors Executive Conference
NOVEMBER 6–8, 2023

The Wigwam | Litchfield, AZ

